SECTION 05 51 00
METAL STAIRS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies steel stairs with railings.

B. Types:

1. Closed riser stairs with concrete filled treads and platforms.
2. Industrial stairs: Closed riser stairs.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS for additional LEED requirements.

B. Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS for VOC limit.

C. Concrete fill for treads and platforms: Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Wall handrails and railings for other than steel stairs: Section 05 50 00, METAL FABRICATIONS.

E. Requirements for shop painting: Section 09 91 00, PAINTING.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate and install metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.

1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 4.79 kN/sq. m (100 lbf/sq. ft.) or a concentrated load of 1.33 kN (300 lbf) on an area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
3. Limit deflection of treads, platforms, and framing members to L/360 or 6.4 mm (1/4 inch), whichever is less.
4. Comply with above requirements and current International Building Code (IBC) requirements. The most stringent requirements shall apply.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. LEED Submittals
   1. Credits MR 4.1 & 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
      a. Include statement indicating costs for each product containing recycled content.
   2. Credits MR 5.1 & 5.2: For products manufactured within 500 miles of project site *and* whose raw materials are extracted, harvested or recovered, within 500 miles of the project site, documentation indicating the location and distance of material manufacturer and point of extraction, harvest, or recovery for each raw material from the Project site.
      a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

C. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
   1. Field welders shall hold an un-expired certificate from the City of

Pittsburgh, PA, Department of Building Inspection.

E. Fabrication/Aesthetic Performance: Comply with applicable provisions of the following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) Code of Standard Practice for Steel Buildings and Bridges, Section 10 for Architecturally Exposed Structural Steel (AESS), latest edition, for portions of metal stair assemblies exposed to view.
2. The National Association of Architectural Metal Manufacturers (NAAMM) Manual, Architectural Metal Products (AMP), Publication 555, Code of Standard Practice for the Architectural Metal Industry, latest edition.
3. The National Association of Architectural Metal Manufacturers (NAAMM) Manual, Architectural Metal Products (AMP), Publication 510, Metal Stairs Manual, latest edition.
4. National Ornamental & Miscellaneous Metals Association (NOMMA) guide for joint finishes (welded steel joints).

   a. Guideline 1: Joint Finishes (Welded Steel Joints).

   Finish #1: No evidence of a welded joint. Ornamental quality; used where appearance is a critical factor. Architectural class metal stairs.

   Finish #2: Completely sanded joint, some undercutting and pinholes okay. Weld of good appearance; used in areas of traffic where highly ornamental quality is not required. Commercial class metal stairs.

   Finish #3: Partially dressed weld with spatter removed. Used in areas where it not subject to view, as in service stairs.

   Finish #4: Good quality, uniform undressed weld with minimal spatter. Acceptable when appearance is not a factor; used in industrial and non-public or non-staff areas.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

B. Deliver such items to Project site in time for installation.

1.7 APPLICATION PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.

B. American Society for Testing and Materials (ASTM):

A36/A36M-05.....Structural Steel
A47-99 (R2004).....Ferritic Malleable Iron Castings
A48-03.....Gray Iron Castings
A53-06.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
A307-07.....Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
A653/653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process
A563-07.....Carbon and Alloy Steel Nuts
A1008-07.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy
A786/A786M-00.....Rolled Steel Floor Plates
A1011-04.....Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy

C. American Welding Society (AWS):
D1.1-04.....Structural Welding Code-Steel
D1.3-98.....Structural Welding Code-Sheet Steel

D. The National Association of Architectural Metal Manufactures (NAAMM) Manuals:
AMP521-01.....Pipe Railing Manual, Including Round Tube

E. American Iron and Steel Institute (AISI):
2001.....Design of Cold-Formed Steel Structural Members

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Design stairs to support a live load of 500 kg/m^2 (100 pounds per square foot).

B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.

C. Design Grating treads in accordance with NAAMM Metal Bar Grating Manual.

D. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide steel products with minimum 25% post-consumer recycled content.

B. Steel Pipe: ASTM A53, Standard Weight, zinc coated.

C. Sheet Steel: ASTM A1008.

E. Structural Steel: ASTM A36.

F. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.
G. Steel Plate: ASTM A1011.
H. Iron Castings: ASTM A48, Class 30.
I. Malleable Iron Castings: ASTM A47.
J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F

2.3 FABRICATION GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, guardrails, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding, unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.
B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
   1. Commercial class, unless otherwise indicated.
C. Shop Assembly: Pre-assemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
E. Ease exposed edges to a radius of approximately 1 mm (1/32 inch), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
F. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap
   3. Weld exposed corners and seams continuously, unless otherwise indicated.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.

6. Where possible, locate welds on unexposed side.
7. Remove welding splatter.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

I. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00, PAINTING.

J. Fasteners:
1. Conceal bolts and screws wherever possible.
2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.

K. Fit stringers to head channel and close ends with steel plates welded in place where shown.

L. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.

2.4 RAILINGS

A. Fabricate railings, including handrails, from steel pipe.
1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.

B. Return ends of handrail to wall and close free end.

C. Provide standard terminal castings where fastened to newel.

D. Space intermediate posts not over six feet on center between end post or newel post.

E. Fabricate handrail brackets from cast malleable iron.

F. Provide standard terminal fittings at ends of post and rails.

2.5 STEEL-FRAMED STAIRS

A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction

above. Locate hanger rods within stud space of shaft-wall construction.

2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 10 gage sheet steel.

1. Steel Sheet: Uncoated cold-rolled steel sheet.
2. Commercial Class Stairs: Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
3. Shape metal pans to include nosing integral with riser.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.6 CLOSED RISER STAIRS

A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.

B. Fabricate pans for treads and platforms, and risers from sheet steel.

C. Form risers with sanitary cove.

D. Fabricate stringers, headers, and other supporting members from structural steel.

E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

2.7 INDUSTRIAL STAIRS AND PLATFORMS

A. Provide treads, platforms, railings, stringers and other supporting members as shown.

B. Treads and platforms of checkered aluminum floor plate:

1. Turn floor plate down to form nosing on treads and edge of platform at head of stairs.
2. Support treads and platforms with angles welded to plate.
3. Do not leave exposed fasteners on top of treads or platform surfaces.
4. Provide flat sheet aluminum risers for stairs with aluminum plate treads where shown.

PART 3 - EXECUTION

3.1 STAIR INSTALLATION

A. Provide hangers and struts required to support the loads imposed.

B. Perform job site welding and bolting as specified for shop fabrication.

C. Set stairs and other members in position and secure to structure as shown.
D. Install stairs plumb, level and true to line.
E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.

3.2 RAILING INSTALLATION

A. Install standard terminal fittings at ends of posts and rails.
B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).
D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.3 FIELD PRIME PAINTING

A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
B. Touch-up abraded areas with same primer paint used for shop priming.
C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

- - - E N D - - -